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Characterization of chlorinated solvents in fractured limestone aquifers is essential for proper development of site specific conceptual models and subsequent risk assessment and remediation. High resolution characterization is challenged by the difficulties involved in collection of intact core samples as water flushing during drilling often results in extensive core losses, especially from zones with soft limestone in contact with flint beds. Field investigations with alternative characterization techniques have been carried out at two Danish sites with tetrachloroethene (PCE) contaminated fractured limestone aquifers. The two sites represent different scales (source and plume) and contaminant levels (DNAPL and dissolved). The scope of the investigations was to evaluate different techniques for characterization of the contaminant distribution in the limestone aquifers and to obtain an improved conceptual understanding of contaminant transport.

At both sites limestone cores were collected with significant core losses. The discrete quantification of chlorinated solvents in the retrieved limestone cores was compared to different FLUTe technologies at the DNAPL site and passive and active multilevel groundwater sampling at the plume scale site. Important information regarding contaminant distribution and potential presence of DNAPL was provided by FACT (FLUTe activated carbon technique) and Water-FLUTe mulitilevel sampling. The data was used to validate a model based tool for interpretation of the FACT field measurements, which allows the conversion of discrete activated carbon concentrations to aqueous concentrations at given hydraulic parameters and FACT parameters. The passive groundwater sampling with snap samplers resulted in significantly different concentration levels and concentration profiles over depth compared to the active sampling by separation pumping with heat pulse technology. The differences between the two techniques decreased with distance to the source area. Overall, the borehole characterization techniques provided an improved conceptual understanding of the contaminant distribution compared to the data obtained by quantification of chlorinated solvents in the limestone cores.